

**NATIONAL AERONAUTICS AND SPACE ADMINISTRATION  
John F. Kennedy Space Center  
Kennedy Space Center, FL 32899**

**Broad Agency Announcement NNK09291248K**

**BROAD AGENCY ANNOUNCEMENT for**

**Constellation Ground Operations Commodities Architecture Study**

**Issued: June 24, 2009**

**PROPOSALS DUE  
July 24, 2009**

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## **INTRODUCTION**

This publication constitutes a Broad Agency Announcement (BAA) as contemplated by Federal Acquisition Regulation (FAR) Part 35 and NASA Federal Acquisition Regulation (NFS) Part 1835. A formal Request for Proposal (RFP), solicitation, and/or additional information regarding this announcement will not be issued. Request for same will be disregarded.

NASA will not issue paper copies of this announcement. NASA reserves the right to select for award all, some, or none of the proposals in response to this announcement. NASA provides no funding for direct reimbursement of proposal development costs. Technical and cost proposals (or any other material) submitted in response to this BAA will not be returned. It is the policy of NASA to treat all proposals as sensitive competitive information and to disclose their contents only for the purposes of evaluation.

Potential offerors may submit questions regarding this BAA in writing via e-mail to Erik C. Whitehill, Contracting Officer, at [Erik.C.Whitehill@NASA.Gov](mailto:Erik.C.Whitehill@NASA.Gov), not later than 4:30 p.m. on July 8, 2009.

For the purpose of minimizing Design, Development, Test, and Evaluation (DDT&E) and life cycle costs, this BAA is soliciting proposals for Industry best practices, innovative concepts, technologies, and processes focused on commodity production, storage, transportation, delivery and transfer to support ground processing and operations of next generation spacecraft for the Human Lunar Return missions at Kennedy Space Center and continued operations of Expendable Launch Vehicle programs at Cape Canaveral Air Force Station.

NASA's safety policy, prioritizes safety to protect: (1) the public, (2) astronauts and pilots, (3) the NASA workforce (including contractor employees working on NASA contracts), and (4) high-value equipment and property. NFS 1852.223-70 defines safety as the freedom from those conditions that can cause death, injury, occupational illness, damage to or loss of equipment or property, or damage to the environment.

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**I. GENERAL INFORMATION**

- 1. Agency Name:** NASA
- 2. Research Opportunity Title:** Constellation Ground Operations Commodities Architecture Study
- 3. Program Name:** NASA KSC Constellation Ground Operations Project
- 4. Response Date:** July 24, 2009
- 5. Point of Contact:** All questions shall be directed to the cognizant NASA Contracting Officer as specified below. All questions shall be submitted in writing. Telephonic inquiries will not be accepted.

Contracting Point of Contact

NASA John F. Kennedy Space Center

Erik C. Whitehill, Mail Code OP-ES

Kennedy Space Center, FL 32899

Telephone: 321-867-5504

Fax: 321-867-1166

Email: [Erik.C.Whitehill@NASA.Gov](mailto:Erik.C.Whitehill@NASA.Gov)

- 7. Partnership.** Space Florida is available for partnership opportunities. The Point of Contact for Space Florida is Conrad Nagel, [cnagel@spaceflorida.gov](mailto:cnagel@spaceflorida.gov).
- 8. Instrument Type(s):** It is anticipated that Firm-Fixed-Priced contracts will result from this solicitation.
- 9. Additional Information:** The BAA and Attachments may be obtained over the internet at <http://prod.nais.nasa.gov> and <http://www.fedbizopps.gov>

**II. ELIGIBILITY INFORMATION**

**1. Eligible Applicants**

All categories of non-NASA U.S. institutions are eligible to submit proposals in response to this BAA. NASA Centers (JPL is considered a NASA Center for the purposes of this BAA) cannot submit proposals to this BAA.

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## **2. Guidelines for Foreign Participation**

Foreign proposals or U.S. proposals with foreign participation shall be treated in accordance with NFS 1835.016-70.

## **3. Export Control**

All offerors shall comply with all U.S. export control laws and regulations in accordance with NASA FAR Supplement 1852.225-70.

## **III. BACKGROUND**

NASA KSC is preparing for the next phases of the Constellation Program that involves the Human Lunar Return. These missions would require the launch of both a manned vehicle (Ares I) as well as a heavy lift vehicle (Ares V) within a short time of one another. This dual launch scenario drives the requirement to perform multiple launch attempts in rapid succession. The commodities demands for such a program far exceed the current capacities available at KSC. In addition to the Constellation needs, expendable launch vehicle programs that launch from the Cape Canaveral Air Force Station (CCAFS) as well as other KSC customers will also require the same commodities from the existing infrastructure. An overview of the current capabilities for KSC and CCAFS is provided as Attachment 1. One option to satisfy future demands would involve simply scaling up the current delivery, storage and transfer capabilities. However, this also results in a scaling up of current losses and other inefficiencies, which further drives up supply and storage requirements. This study looks to identify new and innovative approaches to meeting the commodity demands of the future while minimizing combined development and operations costs. The results of this study may be utilized to develop an architecture and approach regarding new or modified infrastructure and facilities at KSC and CCAFS potentially combined with commercial solutions to support effective, efficient ground operations and processing for the next generation of launch vehicles.

Operational requirements for space launch applications are very different from typical requirements from most industrial gas customers. A four month period of zero demand for liquid hydrogen may be followed by 2 weeks of launch attempts that need 2-3 million gallons. Current methods of cryogenic fluid supply utilize roadable tankers offloading at the launch site (with GN2 coming in a pipeline). With increases in supply and storage requirements over current Space Shuttle operations, this method needs to be re-evaluated. Trading the fixed cost of larger storage tanks versus the operational cost of increased tanker deliveries (especially in peak demand situations) is necessary. Methods of

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balancing the load demands (such as reducing boil off and transport losses), and the development cost of these systems, needs to be evaluated against the operational costs of allowing these inefficiencies. Operational time constraints should also be considered. For example, the time required to replenish the launch pad on-site dewars between launch attempts should be minimized to allow for other operations on the launch pad to also occur during this time frame. Synergy between oxygen and nitrogen production and demand should also be addressed.

General information about the Constellation program and the vehicles can be found at the public website: [http://www.nasa.gov/mission\\_pages/constellation/main/index.html](http://www.nasa.gov/mission_pages/constellation/main/index.html). Information on the Expendable Launch Vehicle programs at CCAFS can be found at <http://www.patrick.af.mil/library/factsheets/index.asp>.

## **IV. TECHNICAL REQUIREMENTS**

NASA KSC is seeking innovative concepts and improved processes to conduct Constellation missions for Human Lunar Return. The quantities of commodities necessary to support launch of both vehicles needed far exceed the current capacities available. The scale of commodities required drives a great need for gains in efficiency over current methods of production, storage, transportation, delivery and transfer. This is further exacerbated by the time constraints of resupply between launch attempts of the launch pad on-site storage tanks. Recovery of Gaseous Helium is also of a concern due to the limited supply. Further efficiencies may be gained through a concerted solution that addresses the needs between Constellation, other NASA KSC commodity users, and the Expendable Launch Vehicle providers at Cape Canaveral Air Force Station. In addition, production systems that can meet market needs in the southeast region may be considered. The offeror shall provide concepts for technical solutions that have a sufficient maturity level to be implemented in time to meet the proposed objectives for Constellation missions for Human Lunar Return in the 2018 timeframe. Modular concepts that can be expanded to meet the increasing demands over the 30 year life cycle should be considered. Proposed concepts can include government owned facilities and infrastructure, commercial operations or lease agreements where the government purchases the commodities, or a combination of the two approaches.

Areas of emphasis include life cycle cost, efficiency, safety, reliability, sustainability, and scalability. The offeror shall identify methods for Liquid Oxygen, Liquid Hydrogen, Gaseous Nitrogen, and Gaseous Helium supply and distribution that are common or extensible for Constellation missions as well as NASA and Air Force Expendable Launch Vehicle missions from Kennedy Space Center and Cape Canaveral Air Force Station. A combined solution that can support multiple programs could prove advantageous over the long run since Constellation, Delta, Atlas, and SpaceX utilize the same commodities.

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Preliminary analyses based on current vehicle designs have been used to determine estimates for the commodity types, quantities, and rates that would be required for the launch of both vehicles (Ares I and Ares V). Based on these values, the established values from the Delta, Atlas, Space X programs, and other customers of these commodities, a theoretical demand profile for each of the commodities to be addressed is provided as Attachment 2 to be used as reference for the magnitude of the future demand. The current Constellation Systems Program Milestone Manifest is provided as Attachment 3.

Current ground support facilities and operations are built upon systems and models leveraging assets and infrastructures from past and present human and non-human rated space launch operations. In order to achieve a more modern, affordable, safe, and sustainable Earth-bound infrastructure to support exploration activities, NASA must bring this infrastructure up-to-date and poised for evolution during the next thirty years. Partnering between NASA and the Air Force will better position both parties for opportunities to improve efficiencies. The proposals in this concept area shall address preliminary design and operations concepts for providing the commodities needed for launch. Included in this scope are production, storage, transportation, delivery and transfer of the commodities to all users at KSC/CCAFS. Concepts that include recovery of Gaseous Helium or other methods to improve energy efficiency and reduce greenhouse gas emissions or use sustainable environmental practices are of particular interest.

In addition to the areas of emphasis mentioned above, proposals in this area shall address objectives addressed by the offeror's concepts including a discussion of and estimates for facility conversion, modification, operation and life-cycle costs. Proposals should include high level construction schedules to achieve infrastructure plans and reflect accommodation of existing Space Shuttle Program, Constellation Program, and Expendable Launch Vehicle Program mission schedules.

## **V. PROPOSALS**

### **a. Submission Instructions**

All proposals in response to this BAA must be submitted electronically via e-mail to Erik C. Whitehill at [Erik.C.Whitehill@NASA.Gov](mailto:Erik.C.Whitehill@NASA.Gov), in MS Word and MS Excel formats.

Page limitations are outlined below. A page is defined as one (1) sheet 8 ½ x 11 inches using a minimum of 12-point Times New Roman font size for text and 8-point for graphics.

The Government intends to evaluate proposals and issue contract awards without discussions with offerors. Therefore, the offeror's initial proposal should contain the offeror's best terms from a price and technical standpoint. The Government reserves the

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right to conduct discussions if the Contracting Officer later determines them to be necessary.

**b. Proposals must include the following material, in this order:**

1. **Part 1: Statement of Work (SOW) (Maximum 5 Pages).** The Offeror shall clearly define its technical approach towards completing a Study of the Constellation Ground Operations Commodities Architecture outlined above, in a detailed Statement of Work. The Statement of Work shall be written for a 104 day Period of Performance, and shall include the offeror's approach towards completing the Draft Study Report, Oral Presentation, and Final Study Report. The nominal length of the Final Oral Presentation shall be two hours to be held at NASA Kennedy Space Center. At a minimum, the Draft Study Report, Oral Presentation, and Final Study Report shall consist of:

Industry best practices, innovative concepts, technologies, and processes focused on commodity production, storage, transportation, delivery and transfer, and recovery to support ground processing and operations of next generation spacecraft for the Human Lunar Return missions from KSC and Expendable Launch Vehicle missions from CCAFS:

1. Commodity Production/Storage/Transportation/Delivery/Transfer/Recovery Concept that meets Program requirements (manifest/schedule/turnaround time/costs)
  - a. Operational Schedules/Timelines
  - b. Operational Costs and Basis of Estimate (Labor & Procurement)
  - c. Assessment of and recommendation for Infrastructure and Ground Systems or commercial operations required to implement.
  - d. Ability to meet KSC and/or Air Force safety standards
2. Approach for Development of the Infrastructure and Ground Systems (Design/Construction/Fab/Activation/Validation/Test):
  - a. Development Schedule
  - b. Development Costs and Basis of Estimate (labor and procurement)
  - c. Life Cycle Costs and Basis of Estimate (labor and procurement)
  - d. Applications of new technologies toward improving processing while lowering operational and life cycle costs.
  - e. Energy efficiency features and application of sustainable environment practices
3. Description of Commercial Operations (if applicable)
  - a. Development Schedule
  - b. Operational Schedules/Timelines
  - c. Operational Costs and Basis of Estimate

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4. Analysis
5. Top risks and potential mitigation strategies.
6. Supporting Data
7. Trade Studies
8. Assessment of technology maturity level and any potential risk to implementation timeline

Note: Infrastructure and Ground Systems includes, but is not limited to, production facilities, storage facilities, and transportation equipment or hardware.

Although this study looks to address the full infrastructure needed for all commodities listed, proposals addressing specific aspects of the solution will also be considered. For example, a strong proposal to provide a helium recovery and re-use system will be considered even if oxygen and nitrogen delivery and storage is not addressed.

2. **Part 2: Key Personnel (Maximum 6 Pages)** The offeror shall describe the proposed roles, education, experience, and other qualifications of no more than two (2) key personnel.
3. **Part 3: Past Performance (Maximum 3 Pages)** The offeror shall provide a list of three (3) previous contracts for requirements that are similar to the requirements of this BAA. For each contract identified, the offeror shall include:
  - (a) Contract Number
  - (b) Contracting Agency/ Customer
  - (c) Points of contact in the program/technical and contracting offices, including accurate telephone numbers
  - (d) Brief contract description
  - (e) The extent to which contract objectives were met, including technical, schedule, cost, and management.
4. **Part 4: Price Proposal.** The price proposal shall include the overall firm-fixed-price, in addition to a detailed breakout of the following costs:
  - (a)Labor: Including Labor Categories, Hours, and Rates
  - (b)Other Direct Costs: Including Travel (number of trips, number of days per trip, departure and arrival destinations, number of people, etc.); Subcontracts and; Materials (itemized cost breakout), As Applicable.
  - (c)Indirect Rates: Including Overhead and G&A
  - (d)Profit



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**VI. SUBMISSION OF LATE PROPOSALS**

Proposals received by the Government after the latest date and time for receipt will not be evaluated.

**VII. EVALUATION INFORMATION**

- 1. Evaluation Factors and Relative Importance.** The following factors shall be used to evaluate proposals, in descending order of importance. Technical Merit, Key Personnel, and Past Performance, when combined, are significantly more important than Price.

**a. Factor 1 - Technical Merit**

Evaluation of Technical Merit will include the following:

The Government will be evaluating the offeror's approach to performing this Concept Study as it relates to the offeror's demonstrated understanding of the objectives for the Constellation Program as well as ongoing Expendable Launch Vehicle programs based on the proposed concepts and approaches for achieving them; the approach in meeting the goals of reduced life cycle cost, increased efficiency, safe, reliable, sustainable, and expandable infrastructure and ground systems and equipment to supply commodities in support of the ground processing and operations; and the plan to assess risk and planned mitigation. Overall life cycle cost will be a key factor in assessing the technical merit.

**b. Factor 2 – Key Personnel**

The Government will be evaluating the proposed roles, education, experience, and other qualifications of the proposed key personnel relative to the requirements of this BAA.

**c. Factor 3 – Past Performance**

The Government will evaluate the "performance" component and "relevance" component of past performance. In assessing relevance, the Government will consider the degree of similarity to the requirement herein, as well as how current the past performance is. In the case of an offeror without a record of relevant past performance or for whom information on past performance is not available, the offeror may not be evaluated favorably or unfavorably on past performance.

**d. Criteria 4 – Price**

Evaluation of price will include the following:

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The overall firm-fixed-price to the Government; the realism and reasonableness of the proposed price and associated elements and; the extent to which the Offeror complied with the specified dollar limits in the BAA.

## VIII. EVALUATION PANEL

Evaluation of the proposals received in response to this Broad Agency Announcement will be accomplished by Government Personnel only. All government personnel participating in evaluation will be bound by appropriate non-disclosure agreements to protect proprietary and source-selection information.

## IX. AWARD INFORMATION

1. **CCR.** Successful offerors not already registered in the Central Contractor Registry (CCR) will be required to register in CCR prior to award of any contract. Information on CCR registration is available at <http://www.ccr.gov>.
2. **Certifications.** A completed package of certifications and representations will be required before the execution of any contract.
3. **Multiple Awards.** NASA anticipates multiple awards, which represent the best value to the Government in accordance with the evaluation criteria. The overall number of awards will be dependent upon the quality and innovativeness of proposed studies, funding availability, and evaluation results.
4. **Period of Performance.** Period of performance of the contracts awarded will be for 104 days following the award effective date.
5. **Award Date.** Selection and award is anticipated for September 2009.
6. **Funding Allocation.** The Government's overall budget for issuing awards under this BAA is anticipated at \$500,000.00. Individual award amounts are limited to not more than \$100,000.00, firm-fixed-price.
7. **Data Rights.** All data produced and delivered under the contract will be "unlimited rights" data under FAR 52.227-14.
8. **Export Control.** Successful offerors shall comply with all U.S. export control laws and regulations in accordance with NASA FAR Supplement 1852.225-70.
9. **Pre-Brief and Tour.** Within 10 days of contract award, NASA will provide a pre-brief to describe current capacities and future requirements in more detail. Introductions on

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NASA and the Air Force safety standards will also be covered. Presentation materials will be made available electronically to all awardees. A tour will be conducted at KSC and CCAFS of the current facilities and infrastructure on the same date as the Pre-Brief.

**10. Contract Deliverables.** The resultant contract awards will include the following Deliverable requirements:

- Mid-term Presentation (due 45 days from contract award effective date)
- Draft Study Report (due 90 days from contract award effective date): 1 Hard Copy and 1 CD-ROM
- Oral Presentation (within 1 (one) week of Draft Study Report submission)
- Final Study Report (due 104 days from contract award effective date): 1 Hard Copy and 1 CD-ROM

At a minimum, the Draft Study Report, Oral Presentation, and Final Study Report shall consist of those elements outlined at Section V.b.1, inclusive of Detailed Budget Requirements and Life Cycle Cost Projections to design, build, and operate facilities and ground support equipment necessary to produce, store, and transport commodities needed to launch space vehicles for Human Lunar Return. The Oral Presentation shall consist of a face-to-face presentation by contractor's senior project personnel of the Draft Study Report's considerations, findings, recommendations, funding requirements profiles, and other key provisions. The nominal length of the presentation shall be two hours and shall be followed by an opportunity for a question and answer session by Government personnel.